

WHAT IS CLAIMED IS:

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- ①. A user interface apparatus comprising:
- a first sensor attached to a first portion of a body of a user;
- 5 a second sensor attached to a second portion different from the first portion;
- means for generating action information of the second portion on the basis of a relative position of the second portion with respect to the first portion,
- 10 which is detected by said first and second sensors; and
- determination means for determining a user instruction corresponding to the generated action information.
2. The apparatus according to claim 1, wherein the
- 15 first portion is a head.
3. The apparatus according to claim 1, wherein the second portion is a hand.
4. The apparatus according to claim 1, wherein said first sensor detects a location/posture of the first
- 20 portion.
5. The apparatus according to claim 1, wherein said second sensor detects a location and posture of the second portion.
6. The apparatus according to claim 1, wherein the
- 25 action information includes information which pertains to a state change of the second portion with respect to

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a location of the first portion, and information which pertains to a location change velocity of the state change.

7. The apparatus according to claim 1, wherein the
5 action information includes information which pertains to a state change of the second portion with respect to a location or location/posture of the first portion, and information which pertains to a location change acceleration of the state change.

10 8. The apparatus according to claim 1, wherein the action information includes information which pertains to a posture of the second portion with respect to a posture of the first portion.

9. The apparatus according to claim 1, wherein the
15 action information includes information which pertains to a moving direction of a location of the second portion with respect to a posture of the first portion.

10. The apparatus according to claim 1, further comprising:

20 means for storing a value of the relative position of the second portion with respect to the first portion, and a plurality of state values which are defined in advance as a result of transition of the value; and

means for storing a plurality of different user instruction values corresponding to the plurality of state values.

11. The apparatus according to claim 1, wherein said
5 determination means decomposes the determined user instruction into a plurality of instruction operands, and outputs the operands.

12. The apparatus according to claim 1, wherein when
10 said generation means determines that a relative relationship between a location/posture of a head detected by said first sensor, and a location/posture of a hand detected by said second sensor indicates an action of the user whose line of sight is pointing to a predetermined portion of the hand,

15 said determination means outputs a user instruction for outputting an operation guidance.

13. The apparatus according to claim 1, further comprising a third sensor for detecting a bent angle of a finger.

20 14. A game apparatus comprising:

a first sensor for detecting a location/posture of a head of a player;

a second sensor for detecting a location/posture of a hand or arm;

25 means for estimating an action of the player on the basis of a relative location/posture of the hand or

arm with respect to the location/posture of the head,
which are detected by said first and second sensors;
and

means for outputting a player command
5 corresponding to the estimated action.

15. The apparatus according to claim 14, further
comprising display means for displaying an image of a
game scene in front of the head of the player for the
player.

10 16. The apparatus according to claim 14, wherein said
display means is a head-mounted display.

17. The apparatus according to claim 14, wherein
three steps including preparation, execution, and
return steps, are prepared for the player command, and
15 the steps are respectively defined as:

a preparation action step for the player command
when the location of the hand of the player moves to a
position behind a position in front of a face of the
player;

20 an execution step for the player command when the
location of the hand of the player moves forward from a
rear position after the preparation action; and

a return action step for the player command when
the location of the hand of the player returns to a
25 position of the face of the player after the forward
movement.

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18. A user interface method for outputting a user instruction to a predetermined apparatus or program, comprising:
- the step of detecting a location of a first portion of a body of a user and a location of a second portion different from the first portion using first and second sensors attached to the user; and
 - the step of determining a user instruction on the basis of a relative position of the second portion with respect to the first portion, which are detected by said first and second sensors, and outputting the determined user instruction to the apparatus or program.
19. The method according to claim 18, wherein said first and second sensors respectively detect locations/postures of the first and second portions.
20. The method according to claim 18, wherein the first portion is a head of the user, and the second portion is a hand of the user.
21. The method according to claim 18, further comprising the step of detecting information which pertains to a state change of the second portion with respect to a location or a location/posture of the first portion, and information which pertains to a location change velocity of the state change.
22. The method according to claim 18, further comprising the step of detecting information which

pertains to a state change of the second portion with respect to a location or a location/posture of the first portion, and information which pertains to a location change acceleration of the state change.

5 23. The method according to claim 18, further comprising the step of detecting a posture of the second portion with respect to a posture of the first portion.

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10 24. The method according to claim 18, further comprising the step of detecting a moving direction of a location of the second portion with respect to a posture of the first portion.

25. The method according to claim 18, further comprising the step of storing a value of the relative
15 position of the second portion with respect to the first portion, and a plurality of user instructions which are defined in advance as a result of transition of the value.

20 26. The method according to claim 18, wherein the output step includes the step of decomposing the determined user instruction into a plurality of instruction operands, and outputting the operands.

25 27. The method according to claim 18, wherein when it is determined that a relative relationship between a location/posture of a head detected by said first sensor, and a location/posture of a hand detected by

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said second sensor indicates an action of the user whose line of sight is pointing to a predetermined portion of the hand,

the output step includes the step of outputting a user instruction for outputting an operation guidance.

28. The method according to claim 19, further comprising the step of detecting a bent angle of a finger from a third sensor.

29. A computer readable storage medium, which stores a program of a user interface method for outputting a user instruction to a predetermined apparatus or program, storing:

a program step of detecting a location of a first portion of a body of a user and a location of a second portion different from the first portion using first and second sensors attached to the user; and

a program step of determining a user instruction on the basis of a relative position of the second portion with respect to the first portion, which are detected by said first and second sensors, and outputting the determined user instruction to the apparatus or program.

30. A game apparatus for displaying a CG image in front of a field of view of a player, comprising:

a first sensor for detecting a location of a first portion of a body of the player;

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a second sensor for detecting a location of a second portion of the player, which is different from the first portion; and

game progress means for proceeding with a game by
5 determining a command the player wants to input on the basis of a relative position of the second portion with respect to the first portion, which are detected by said first and second sensors, and executing the determined command.

10 31. The apparatus according to claim 30, wherein said first and second sensors respectively detect locations/postures of the first and second portions.

32. The apparatus according to claim 30, wherein the
15 first portion is a head of the player, and the second portion is a hand of the player.

33. The apparatus according to claim 30, further comprising means for detecting information which
pertains to a state change of the second portion with respect to the location or a location/posture of the
20 first portion, and information which pertains to a location change velocity of the state change, and

wherein the command is generated in further consideration of the detected velocity.

34. The apparatus according to claim 30, further
25 comprising means for detecting information which pertains to a state change of the second portion with

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respect to the location or a location/posture of the
first portion, and information which pertains to a
location change acceleration of the state change, and

5 wherein the command is generated in further
consideration of the detected acceleration.

35. The apparatus according to claim 30, further
comprising means for detecting a posture of the second
portion with respect to a posture of the first portion,
and

10 wherein the command is generated in further
consideration of the detected posture of the second
portion.

36. The apparatus according to claim 30, further
comprising means for detecting a moving direction of
15 the location of the second portion with respect to a
posture of the first portion, and wherein the command
is generated in further consideration of the detected
moving direction of the location of the second portion.

37. The apparatus according to claim 30, further
20 comprising a memory for storing a value of the relative
position of the second portion with respect to the
first portion, and a plurality of player commands which
are defined in advance as a result of transition of the
value.

25 38. The apparatus according to claim 30, wherein said
game progress means decomposes the determined player

command into a plurality of operands, and executes the command in accordance with the plurality of decomposed operands.

39. The apparatus according to claim 33, wherein when
5 a relative relationship between a location/posture of a head detected by said first sensor, and a location/posture of a hand detected by said second sensor indicates that a line of sight of the player is pointing to a predetermined portion of the hand,
10 said game progress means generates a player command for outputting an operation guidance.

40. The apparatus according to claim 30, further comprising a third sensor for detecting a bent angle of a finger.

41. The apparatus according to claim 1, wherein the
15 action information further includes geometric information of the first and second portions in a reference coordinate system.

42. The apparatus according to claim 14, wherein said
20 estimation means extracts geometric information of the first and second portions in a reference coordinate system, and estimates a player action on the basis of the geometric information.

43. The method according to claim 18, wherein the
25 detection step includes the step of extracting

geometric information of the first and second portions in a reference coordinate system.

44. The apparatus according to claim 30, wherein said game progress means further extracts geometric

5 information of the first and second portions in a reference coordinate system, estimates an action of the player on the basis of the geometric information, and determines the command the player wants to input on the basis of the estimated action.

10 45. An interface apparatus comprising:

a first sensor for detecting a location or motion of a first portion of a body of a user;

a second sensor for detecting a location or motion of a second portion of the user, which is
15 different from the first portion;

determination means for analyzing outputs from said first and second sensors and determining a command input by the user on the basis of patterns of the outputs from said first and second sensors; and

20 output means for outputting the command determined by said determination means to an object to be controlled.

46. The apparatus according to claim 45, wherein the first portion is a head, and the second portion is a
25 hand.

47. The apparatus according to claim 45, wherein said first and second sensors respectively detect locations and postures of the first and second portions.

48. The apparatus according to claim 47, wherein said
5 first and second sensors respectively detect location change velocities, location change accelerations, and moving directions of the first and second portions.

49. The apparatus according to claim 48, wherein said
10 determination means analyzes an action of the user using information of a change in location, the location change velocity, location change acceleration, and relative moving direction of the second portion with respect to the first portion, and specifies a command corresponding to the action.

50. The apparatus according to claim 49, wherein said
15 determination means has storage information which defines in advance a relationship between the action of the user and the corresponding command.

51. The apparatus according to claim 50, wherein the
20 command output from said determination means is supplied to the object to be controlled, and an image corresponding to the command is displayed.

52. A user interface method comprising:
the first detection step of detecting a location
25 or motion of a first portion of a body of a user;

the second detection step of detecting a location or motion of a second portion of the user, which is different from the first portion;

the determination step of analyzing outputs of the first and second detection steps and determining a command input by the user on the basis of patterns of the outputs of the first and second detection steps; and

the output step of outputting the command determined in the determination step to an object to be controlled.

53. The method according to claim 52, wherein the first portion is a head, and the second portion is a hand.

54. The method according to claim 52, wherein the first and second detection steps include the steps of respectively detecting locations and postures of the first and second portions.

55. The method according to claim 54, wherein the first and second detection steps include the steps of respectively detecting location change velocities, location change accelerations, and moving directions of the first and second portions.

56. The method according to claim 55, wherein the determination step includes the step of analyzing an action of the user using information of a change in

location, the location change velocity, location change acceleration, and relative moving direction of the second portion with respect to the first portion, and specifying a command corresponding to the action.

5 57. The method according to claim 56, wherein the determination step includes the step of determining the command on the basis of storage information which defines in advance a relationship between the action of the user and the corresponding command.

10 58. The method according to claim 57, wherein the object to be controlled displays an image corresponding to the command.